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Case Report

Prolonged cholinergic crisis and compartment syndrome following subcutaneous injection of an organophosphate compound for suicide attempt

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Abstract

A case of poisoning with highly lipid soluble organophosphate compound, fenthion is reported in which cholinergic crisis recurred upto 25 days following a suicide attempt. Subcutaneous injection of fenthion in the antecubital fossa by the patient produced massive swelling, cellulitis and compartment syndrome of the left arm. Emergency fasciotomy helped in restoration of circulation and saved the limb from being amputated.
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Keywords: Subcutaneous organophosphate injection; Compartment syndrome; Prolonged cholinergic crisis

1. Introduction

Cholinergic phase following organophosphate compounds (OPC) poisoning can have onset as early as within 5 min, almost always within 12 h and subsides by 24–48 h.[1,2] Highly lipid soluble compounds can have delayed onset with persistent or recurrent cholinergic crisis for a longer period due to redistribution of the agent from peripheral stores back into the blood stream.[3,4] Other OPC are known to deposit in muscles particularly in diaphragm.[5,6] Self-poisoning by ingestion is the commonest mode of intoxication. There are few reports of suicide attempt by self-injection of an OPC.[7–9] We report a case of subcutaneous injection of fenthion by patient in her arm in which cholinergic crisis recurred 25 days after suicide attempt. Massive swelling leading to compartment syndrome required urgent fasciotomy to save the affected arm.

2. Case report

A 22-year old female with acute onset of abdominal pain, vomiting, increased salivation and muscle twitching reported to the hospital. The patient admitted that she had attempted suicide by subcutaneous injection of 3–4 ml of an insecticide (BAYTEX 1000 containing 82.5% w/w fenthion) in the antecubital fossa of left arm six hours ago. A diagnosis of OPC poisoning was made and treatment with atropine and pralidoxime started but her condition deteriorated and she became unconscious with poor respiratory efforts. She was intubated and kept on ventilatory support in the ICU.

Serum cholinesterase levels were 17.5 IU/L (2150–4950 IU/L normal reference). Atropine infusion and injection of pralidoxime 1 g i.v. given over 30 min followed by 1 g every 8 h were continued for 3 days. On second day of admission, she developed massive swelling and blebs of the affected arm, extending up to the shoulder. Her radial pulse was found to be absent. An emergency fasciotomy of the arm restored the radial pulse (Fig. 1). Gradually there was complete resolution of her cholinergic symptoms.

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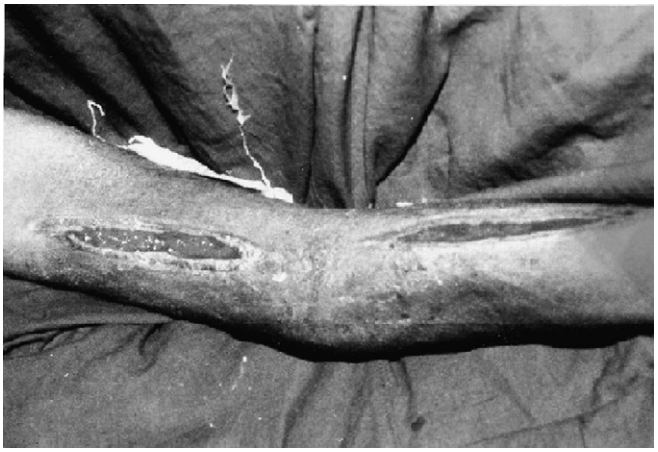

Fig. 1. Photograph of the affected arm showing fasciotomy incisions.

Atropine was tapered off and she was weaned from artificial ventilation and extubated on the fourth day.

On sixth day, patient again became drowsy and developed weakness affecting both proximal and distal limb muscles associated with bradycardia, increased airway secretions and bronchospasm. Cranial nerves were spared. Progressive hypoventilation developed for which patient was reintubated and ventilation instituted. Atropine and pralidoxime were restarted. By eighth day, her symptoms resolved completely. Atropine and pralidoxime were discontinued. Her FVC was consistently greater than 1.7 L and she was extubated. She again had reoccurrence of cholinergic symptoms on tenth day of admission and was again intubated and put on artificial ventilation. Serum cholinesterase was 33 IU/L. Patient was successfully separated from ventilator four times thereafter, however, every time she developed cholinergic symptoms within 36–48 h of stopping atropine and pralidoxime and required reinstitution of ventilatory support. Finally, she was successfully weaned from ventilator on day 31 and was shifted to the ward on 35th day of her admission to ICU.

3. Discussion

Fenthion [$(CH_3O)_2P(S)OC_6H_3(CH_3)SCH_3$] is a longer acting organophosphate in comparison to other OPC. There are two apparent reasons for its prolonged cholinergic activity namely the high lipid solubility and sulphur moiety in its chemical structure. The oil blood solubility coefficient of fenthion is 9000 which leads to extensive distribution in adipose tissues. Continuous displacement of the agent from adipose tissue reinhibits acetyl cholinesterase's that have been reactivated by oximes might result in prolonged cholinergic phase. Secondly, fenthion has two sulphur groups, after bioactivation it is converted to oxon which has greater toxicity. The process of bioactivation can delay the onset of symptoms after exposure. Prolonged cholinergic crisis following fenthion and other fat soluble insecticides has been reported.[3,4] In our patient subcutaneous injection of fenthion could also have contributed to prolonged duration of cholinergic phase by forming a drug depot in subcutaneous fat with slow release into the systemic circulation.

Our patient developed marked cellulitis and edema of the left arm leading to compartment syndrome on the second day of subcutaneous injection of fenthion. Promptly done fasciotomy helped in saving the limb. In cases of self-injection of insecticide local complications are commonly seen. These patients can also develop acute atraumatic compartment syndrome which can be potentially limb and life threatening.[10]

Measurements of plasma cholinesterase and erythrocyte cholinesterase activity are the most useful methods for confirming an organophosphate exposure. However, they cannot be regarded as biomarkers of toxicity because cholinesterase levels may not reflect acetyl cholinesterase activity at the neuronal level due to biochemical differences between the two enzymes and difference in the enzyme's location.

Our patient had repeated relapses of cholinergic overactivity after initial successful management. Although, the incidence of intermediate syndrome is higher with fenthion poisoning, it did not appear to be the cause of prolonged course in our patient because the weakness affected both proximal and distal limb muscles equally with sparing of cranial nerves and muscarinic symptoms were present. Serum cholinesterase values repeated after third episode of cholinergic overactivity were also found to be low.

In an earlier report, authors were able to confirm the presence of fenthion in fatty tissues and its metabolites in urine just before the patient developed third episode of cholinergic crisis and its absence from fat tissues coincided with clinical signs of recovery. They suggested that repeated fat tissue biopsy, being a simple and easily repeatable procedure, can help in the proper management of prolonged poisoning with highly lipid soluble OPC.[4] However, the results of specific analysis are not readily available and toxic levels for individual agents have not been established, the clinical use of such measurements is limited.

This case report emphasizes the importance of prolonged observation of patients who have poisoning with highly lipid soluble OPC. The treating physician must have a high index of suspicion to promptly recognize and treat acute atraumatic compartment syndrome in cases of self-injection of insecticide to avoid permanent disability.

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